

Dear \_\_\_\_\_

Despite the depressing, mellowing news you bore, it was good to see you again and gain all the other kinds of reinforcement you provide in such abundance. I have discussed the matter with my good frau, and we are both looking forward to a family visit from the \_\_\_\_\_ come Sailing Season and after sitting out time, the flat essay alone-ish.

The study on sleep. Based on many diverse lines of experimentation, observation and reasoning, we have come tentatively to advance the hypothesis that, all other things equal, human beings who use as body-temperature, buoyant as the solution as their sleeping environment rather than conventional sleeping environments will experience a sizable reduction in the amount of time they either can spend or feel they must spend sleeping in order to maintain thermal operating efficiency. A review of the significance of (a) such an increase in effective activity time, if obtainable, and (b) the fact that, once again in a matter vital to our national interests, the Soviets appear to have outstripped us (i.e., in sleep research and in development of means to achieve a radical reduction in sleeping time), it is proposed that a controlled experiment be carried out as soon as possible to test the hypothesis advanced. For some time now, \_\_\_\_\_ and I have been involved in developing equipment to be used in precisely such an experiment.

Compactly, there is what is required to carry it out:

1. Twenty relatively normal, healthy male subjects, age group 17-24, good swimmers, preferably from a institutionally regulated population such as that of an Air Force Base.

2. \_\_\_\_\_

3. As the director of the experiment, Dr. \_\_\_\_\_

March 2, 1963

## 4. As Administrator,

## Procedure and Timing:

1. From receipt of funds for construction of the Aquarrest units, approximately 24-3 months to build the experimental equipment.
2. During this period, all arrangements preparing for the controlled experiment can be made.
3. The controlled experiment will begin one week before the equipment is installed in the experimental laboratory or other suitable place where it is to be held.
  - a) During this week, "normal" sleep records will be compiled over each 24-hour period on each subject.
  - b) During the next week, sleep records will continue, but subjects will begin a one-hour-per-day familiarization with the experimental equipment and environment.
  - c) Having been randomly assigned to Groups A and B, subjects will then begin the controlled experiment, as follows:

|        | Control Group<br>(Sleeps on standard Army cots on the equivalent) | Experimental Group<br>(Sleeps in body-temperature saline solution*) |
|--------|-------------------------------------------------------------------|---------------------------------------------------------------------|
| Week 1 | Group A                                                           | Group B                                                             |
| Week 2 | Group B                                                           | Group A                                                             |
| Week 3 | Group A                                                           | Group B                                                             |
| Week 4 | Group B                                                           | Group A                                                             |

\*Salinity adjusted during familiarization in order to provide (a) equivalent individual buoyancy per body density, and (b) minimum maceration or other electrolytic effects.

- d) Each group will "go to bed" at the same time; each group, should subjects feel like doing so, will be permitted at any time during the 24-hour cycle to return to the experimental environment and "rest" or sleep, provided only that the environment be that to which their group is assigned for the week. Should any subjects from either group awaken after "going to bed" and wish to do so, they may use the same recreational facilities until standard morning routine begins; food and drink will be provided.
- e) During the experiment, sleep recordings will be placed on a 15-minute basis. Certain basic physiological and psychological measurements (including metabolism, pulse, respiration, etc.) will be taken.



Dr. [redacted]

March 2, 1965

Estimated costs for the experiment are as follows:

1. Construction of ten units of experimental equipment
2. Conducting the experiment per se
3. Administration and preparation

If sponsors for the experiment should wish to obtain the equipment following the experiment, [redacted] must charge something.

It is believed that few experiments have been proposed which stand to achieve so much for so little, and, further, that there are urgencies affecting, and profoundly, the national security in so doing.

Any help you may provide in securing support for this experiment will be welcome indeed. Should you wish to undertake a consultative and/or advisory role in its implementation, that too would be welcome indeed.

Again, my thanks for your interest. I will keep you informed of any significant developments.

Cordially,

[redacted signature]

APPLICATIONS AND SUGGESTED MODIFICATIONS FOR AQUAREST

January 1963

The following paragraphs contain some suggested applications for the basic Aquarest system which may prove to extend its present scope. Perhaps some of these may prove to have very attractive markets. Some of these are random ideas which are strictly my own, others are the result of conversations I have had with friends of mine who are in the medical profession. Air Force and NASA experiments in simulated weightlessness using saline water in tanks kept at approximately 92 degrees F suggest that:

1. Water immersion permits sleep needs to be greatly reduced, possibly cut in half.
2. The subject cannot stay in the water for a prolonged period of time; 6 or 7 hours would appear to be the maximum.
3. The subject should be in a saline water solution as closely approximating blood plasma as possible.

Concerning your comments on the fact that the Russians may be ahead of us in sleep research, I fully agree with you. In 1959, I was a guest of the Soviet Academy of Sciences for one month touring research institutes and universities. This was during the so-called "Era of good feeling" and quite a few Americans were invited over there in exchange for similar invitations to a number of Russians who went through similar activities in this country. I did discuss the subject of sleep one or twice with members of the Academy of Medical Sciences and they said that considerable work was being done, however, they mentioned drug research so I gathered that the research they were speaking of was more or less



among pharmaceutical lines. However, it may be that they were only responsible for one phase of what may have been a much broader program. They were very concerned with environmental factors since their entire philosophy stresses ideal environments. Therefore, your interpretation of direction of research would tend to be more or less in their natural course of research direction. In broad ranging discussions on foreseeable results of Soviet research, a lowered sleep requirement was mentioned by more than one person. This would tie in with the well known Stakhanovistic practices which prevailed in the early 1930's and still exist to some extent, particularly among professional people.

I trust you have already contacted the National Institutes of Health to see if they had some funds available for sleep research. As you may know, the National Institutes of Health are strongly influenced by political considerations and most of the medical research funds in this country only go to areas in which the general public is aware of the need for research. Consequently, "blue sky research" or "blue sky research" is very poorly supported at the present time in many areas. I might add that [redacted] own principal field, which presently may be broadly described as technology related to "space exploration" was in the same position in the early 1950's. In fact, astronautics really did not receive support it deserved until 1957 when Sputnik caused us to realize that we were far behind in this particular area. So, I can sympathize with you in your frustration at a continuing tendency to ignore what would seem to be another important research area which the Soviet Union has apparently recognized as a field of investigation with significant economic and military potential.

It is of particular interest that you mention that the Aquarest has been used in the treatment of burns. It seemed to me that a saline water solution closely duplicating that of human blood serum and containing various therapeutic or pharmacological agents could provide an ideal treatment for a severely burned subject. Saline solutions at normal pressures contain some dissolved oxygen which would feed the burned tissues. If the Aquarest were placed in a pressure chamber in which the pressure could be periodically raised to 3 or 3 1/2 atmospheres, then the saline solution could contain enough dissolved oxygen to supply as much oxygen to the burned skin tissues as would normally be supplied by a blood stream.

There have been experiments with monkeys in which all the blood has been taken out of the monkey in a chamber of 3 1/2 atmospheres. A solution was transfused through the monkey permitting him to live without blood cells simply obtaining enough dissolved oxygen from the saline solution. It seems reasonable why this same principle should not apply to treatment of burned areas outside the body. Possibly the patient could breathe a special mixture of gases with a much slower oxygen intake than 20% (perhaps 5 or 8% oxygen content) and remain in the pressure chamber within an Aquarest gear for an prolonged period of time.

The use of control pressures in various diseases is a comparatively new area of investigation. It is called hyperbaric research. At the present time, the leading work in this area is being conducted in Scotland and in Holland. In both of these areas they have large hyperbaric chambers enabling entire surgical teams to perform operations. The chambers are large enough to contain all the equipment necessary for the various surgical procedures which are carried out under controlled pressure conditions. Recently quite a bit of publicity has been given to hyperbaric treatment of people suffering from lockjaw. It has



been found that penicillin is much more effective if a person is in an atmosphere of approximately  $3\frac{1}{2}$  times normal. Several cases of severe lock jaw have been cured recently including children and elderly people by placing them in a hyperbaric chamber for several hours, increasing the oxygen tension in the tissues and administering large doses of penicillin. I think that your Aquarest unit combined with a hyperbaric chamber and associated with controls could revolutionize the treatment and cure of many skin illnesses and severe burn conditions.

It may be of interest that reduced temperatures (hypothermia) have often been suggested as means of arresting the aging process or at least reducing the rate of aging. A research program using Aquarest suspension would be an ideal medium to experiment with the possibility of reducing the temperature of a person mainly during the hours of sleep. Certain primitive people have been found to sleep at a much lower temperature than normal (in the neighborhood of 89-91 degrees F). This apparently adaptive phenomenon does not appear to be injurious to their health, in fact, is an absolute necessity when people totally devoid of clothes are asleep without any type of blankets for protection on the bare desert where very low temperatures are frequently encountered at night. There is some debate on whether this phenomenon is hereditary or result of adaption; however it is believed to be a result of adaption. Drugs which would stop shivering, combined with the sleep promoting qualities of Aquarest, might be beneficial in experimenting with lower temperatures during the period of sleep.

The whole subject of the aging process is extremely controversial and there are some 200 theories on the aging of mammals. Some fish do not show any signs of aging and are really more or less subject to continuous "half life" expectation in which the law of averages eventually catches up with them through disease.

for natural enemies. We know very little about the life span of mammals that live in the water or at least comparatively little. Therefore one can speculate that something similar to the Aquarest, which would promote sleep, should eliminate some of the effects of stress over a period of years and have a beneficial effect on longevity. In fact, I would suspect that Aquarest, sleep, and related therapy could add as much as 10 to 20 percent to the average life span of a reasonably healthy individual providing they started not too far along in the life cycle.

Aquarest would be an ideal means to exchange materials through the skin. Perhaps the Aquarest unit could be used in a manner similar to the artificial kidney in which skin would be cleansed and beneficial compounds in the solution could gradually enter the body. This is not a new idea, in fact it is also one which apparently appeals to the scientists in the Soviet Union. The famous Russian biologist, Olga Lepeshinskaya, recommended the regeneration of skin by hydrotherapy in a solution of bicarbonate of soda. Whether they are doing work along this line is difficult to say; however, hydrotherapy is much more advanced in Europe than it is in the United States.

Experiments with controlled pressure research using Aquarest units might include cyclic pressures which would permit the cessation of breathing. This has been done by simply varying the pressure of the air in the lungs so that there was a cyclic change of density from say 2 atmospheres to 1 atmosphere to 2 atmospheres to 1 atmosphere and so on. It would bring in enough oxygen and remove the carbon dioxide so that all motion of the lungs ceased. There have been several experimental units built around this principle to test the theories in the treatment of tuberculosis and other lung diseases. Almost all the people



that have been in these special chambers report that the effect is extremely restful. For the first time in their life they are almost perfectly still and the heart's load is said to be greatly reduced. Conceivably sleep in Aquarest unit coupled with some type of varying technique could permit even greater relaxation and rest than anything which is known in nature. If the Aquarest is essentially an improvement on nature, therefore this could be considered.

This whole area of research opened by Aquarest should be ideal in the training of astronauts. Here, men who will be engaged in long range missions must be reconditioned. In the not too distant future, astronauts will be required to spend considerable lengths of time in the space stations and eventually they will be going on planetary missions where periods in space will probably exceed one or possibly even two years.

The Aquarest unit would be ideal to use in various training situations with these astronauts preparing them gradually for periods of weightlessness. Some form of weightlessness simulation using water suspension is bound to play a role in the more advanced training of astronauts who will be forced to endure long periods of weightlessness in the more advanced missions.

Application for use of Aquarest in the home will probably necessitate a considerable re-education on the part of the general public. I do not mean to say this cannot be done. In fact, I think with the proper type of PR and educational campaign it should be possible to change a mode of living, a facet of life, which has remained constant throughout civilization.

I am not sure of the statistics on the amount of money Americans spend for various sleeping drugs in the United States; however, I believe they are very high, in excess of one hundred million a year, possibly much higher than that.

I believe that anyone would appreciate the basic advantage which could be gained if the so-called elite group in any nation were to be able to greatly reduce the amount of sleep they require and at the same time increase their over-all efficiency. Adding four productive hours to the day could have a tremendous economic effect over a comparatively short period of time. This is particularly important with creative people such as scientists, engineers and executive administrators in various corporations, institutions and universities engaged in research and development activities. Our notoriously slow lead times might be greatly reduced. In fact, it would not be completely improbable that such a breakthrough conceivably could be the key or one of the principal factors in deciding which system of government ultimately wins the protracted conflict which we currently call the cold war.